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(वी सी आई) उपचारित पेपर —
विशिष्ट
(पहला पुनरीक्षण)

**Volatile Corrosion Inhibitor (VCI)
Treated Paper — Specification**
(*First Revision*)

ICS 75.100

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FOREWORD

This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Lubricants and their Related Products Sectional Committee had approved by the Petroleum Coal and Related Products Division Council.

This standard was initially published in 1972. In this revision item for references and batch number in the marking clause have been included.

Volatile corrosion inhibitor treated papers are used as packaging papers which, when wrapped around ferrous metals components, provide temporary protection to them against corrosion for short periods on account of the vapours emitted by the chemicals used to impregnate or coat such papers. The paper should not produce obnoxious vapours in such concentrations as to cause annoyance or health hazard to the persons handling them.

Although the quantity of loading of the paper with the chemicals and their volatility are considered as characteristics for which requirements should preferably be given, these are omitted in this standard in the absence of suitable methods of test.

This standard contains **5.1** which calls for agreement between the purchaser and the supplier.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded value should be the same as that of the specified value in this standard.

Indian Standard

VOLATILE CORROSION INHIBITOR (VCI) TREATED PAPER — SPECIFICATION

(First Revision)

1 SCOPE

This standard covers the requirements and methods of sampling and test for packaging papers which are coated or impregnated with a corrosion inhibitor which emits its vapour to the metal surface when kept in an enclosed space.

2 REFERENCES

The following standards contains provisions which through reference in this text constitute provisions of this standard. At the time of publication the editions indicated were valid. All standards are subject to revisions, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

<i>IS No.</i>	<i>Title</i>
517 : 1986	Specification for methanol (methyl alcohol) (<i>first revision</i>)
758 : 1988	Specification for handloom cotton gauze, absorbent (<i>first revision</i>)
1060 (Part 1) : 1966	Methods of sampling and test for paper and allied products
1070 : 1992	Reagent grade water — Specification (<i>third revision</i>)
1570 (Part 2/Sec 1) : 1979	Schedules for wrought steels : Part 2 carbon steels (unalloyed steels), Section 1 Wrought products (other than Wires) with specified chemical composition and related properties
1745 : 1978	Specification for petroleum hydrocarbon solvents (<i>second revision</i>)
1796 : 1986	Specification for crude glycerine and refined glycerine (<i>second revision</i>)
3099 (Part 2) : 1965	Microscopes — Slips and slides — Specification Part 2 microscope slides (<i>first revision</i>)
3178 : 1965	Specification for abrasive emery grain

3 CLASSES

Volatile corrosion inhibitor (VCI) treated paper shall be of the following two classes:

- a) Class 1 — Heavy duty, and
- b) Class 2 — Light duty.

4 REQUIREMENTS

4.1 Volatile corrosion inhibitor (VCI) treated paper shall be uniformly made and it should be free from defects which would impair its usefulness. In addition, the sheets shall not stick together so as not to cause tearing or injury when unrolled or when the sheets are separated.

4.2 The paper shall not show any appreciable loss of coating or impregnant in normal handling operations.

4.3 Sizes

Unless otherwise specified, rolls shall be one metre wide and 100m long and shall be uniformly wound. Flat cut paper shall be 50 × 100 cm. The tolerance on the width of the roll or sheet size shall, not exceed ± 3 mm.

4.4 The volatile corrosion inhibitor (VCI) treated paper shall also comply with the requirements given in Table 1.

5 PACKING AND MARKING

5.1 Packing

The volatile corrosion inhibitor (VCI) treated paper shall be packed as agreed to between the purchaser and the supplier.

5.2 Marking

The package containing the paper shall be marked with the following:

- a) Class and size;
- b) Name of the manufacturer and trademark, if any;
- c) Date of manufacture; and
- d) Batch number / Lot number.

5.2.1 The package shall also be marked with the following cautionary notice:

‘CAUTION — USE ADEQUATE VENTILATION. WASH HANDS, CLEAN WITH SOAP AND WATER AFTER USE. STORE PAPER IN COOL AND DRY PLACE.’

Table 1 Requirements for Volatile Corrosion Inhibitor (VCI) Treated Paper
(Clause 4.4)

Sl No.	Characteristic	Requirement		Method of Test, Ref to	
		Class 1	Class 2	Annex	Clause No. of IS 1060 (Part 1)
(1)	(2)	(3)	(4)	(5)	(6)
i)	Burst factor, <i>Min</i>	30	20	—	12.5
ii)	Tear factor, <i>Min</i>	120	75	—	12.7
iii)	pH of treated paper	$\leftarrow 7.0 \pm 1.0 \rightarrow$		—	10
iv)	Vapour inhibiting ability	To pass the test		A	—
v)	Contact corrosivity	To pass the test		B	—
vi)	Long term protection	To pass the test		C	—

NOTE — Where the toxicity status of the impregnating chemicals is not known or where the toxicity status is clearly unsuitable for use with foodstuffs, the paper shall not be used to wrap articles which come in contact with foodstuffs.

5.3 BIS Certification Marking

The product may also be marked with Standard Mark.

5.3.1 The use of the Standard Mark is governed by the provisions of *Bureau of Indian Standards Act, 1986* and the Rules and Regulations made thereunder. The details of conditions under which the licence for the use of Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

6 SAMPLING

Representative samples of the material shall be drawn as prescribed in IS 1060 (Part 1).

7 TEST CONDITIONS

7.1 Tests shall be made under the controlled atmospheric conditions having a relative humidity of 65 ± 5 percent and a temperature of $27 \pm 2^\circ\text{C}$. In case proper conditioning facilities are not available for control testing, the same may be carried out at other conditions as convenient. However, for referee purposes, the tests shall be carried out under the specified controlled atmospheric conditions.

7.2 Cleaning the Test Apparatus

7.2.1 The material used in the preparation of panels

and test specimens shall be clean and free from contamination. Solvents shall be clean and renewed frequently. In all stages of treatment the handling of panel with bare hands shall be avoided. Panels shall not be permitted to contact contaminated surfaces during the cleaning procedure.

7.2.2 After polishing the metal panels and the test specimens as specified for each procedure, they shall be cleaned with cotton gauze (*see* IS 758) and then scrubbed in a beaker of hot petroleum hydrocarbon solvent 145/205 (*see* IS 1745) with a cotton gauze swab. This shall be followed by successive immersions in hot petroleum hydrocarbon solvent 145/205, 95 percent methanol and boiling absolute methanol (*see* IS 517); then allowed to dry and stored in a desiccators until ready for use. If storage of more than 24 h occurs, the surface preparation shall be repeated starting with the hand polishing.

7.3 Precautions

Care shall be taken to segregate test samples and to avoid accidental contamination. Hands shall be washed after each handling of corrosion inhibitor. Vapours of the material shall not be inhaled.

8 QUALITY OF REAGENTS

Unless otherwise specified, pure chemicals and distilled water (*see* IS 1070) shall be used in tests.

NOTE — 'Pure chemicals' shall mean chemicals that do not contain impurities which affect the results of analysis.

ANNEX A

[Table 1, Sl No. (iv)]

TEST FOR VAPOUR INHIBITING ABILITY (VIA TEST)

A-1 GENERAL

The vapour inhibition test is conducted to see the corrosion inhibitive efficiency of the sample as received and of the exhausted samples.

A-2 APPARATUS

A-2.1 The test apparatus consisting of the beaker assembly (*see A-2.1.1*) and the exhaustion assembly (*see A-2.1.2*) shall be used for conducting the VIA test.

A-2.1.1 Beaker Assembly, mainly consists of a controlled electric heater (*see Note*), a beaker of 5 litre capacity (approximately 267 mm in height and 170 mm outer diameter) made of heat resistance glass without spout and fitted with a rubber gasket to take the cover having three hooks for hanging the test specimens and a thermostatic control unit capable of controlling the heater to maintain the temperature of air space between 32°C and 35°C. The beaker is also provided with a metallic water cooling device made of soft metal tubing of 8 mm diameter through which water is passed for helping in the condensation of the moisture inside the beaker. The number of turns of the coils should be so arranged that the top of the coil is 60 to 65 mm below the level of the top of panels.

NOTE — Heater of 150 W should be so arranged that 50 W is on continuously and 100 W is controlled by thermostat.

A-2.1.2 Exhaustion Assembly, consisting of a set of two glass jars each of 500 ml capacity, 60 mm in diameter and 170 mm in height. Each jar shall be fitted with a rubber bung having an inlet and an outlet tube. A glass trap shall also be used. In one jar, glycerine of relative density, 1.80 at 20°C shall be taken up to a height of 12 mm from the bottom. The inlet glass in this jar shall be kept dipped in the glycerine water up to the depth of 50 mm. The outlet tube shall first be connected

to the trap and then to the second jar containing 100 × 100 mm of the VCI treated paper lightly rolled and kept vertically inside the second jar. The whole assembly shall be maintained at a temperature of 40°C either in an oven or a suitable thermostat. Air at the rate of 100 ml/s shall be passed through the assembly for a period of 48 h.

A-2.2 Test Specimens

Three steel panels 50 × 25 × 1.3 mm or mild steel rods 50 mm long and 1 mm in diameter, properly cleaned and burnished with 0 Grade emery paper, wrapped twice with the fresh or the exhausted VCI treated paper as the case may be.

A-3 PROCEDURE

A-3.1 Pour 500 ml of water in the beaker and heat the beaker to attain a temperature of 40 ± 1°C in the air phase inside the beaker.

A-3.2 Tie three test specimens with threads and hang them from the hooks on the cover of the beaker.

A-3.3 Allow the test specimens to remain in the beaker for the following periods of time:

- a) 120 h in case fresh VCI treated paper is wrapped on the test specimens, and
- b) 95 h in case exhausted VCI treated paper is wrapped on the test specimens.

A-3.4 After this period, take out the specimens, remove the VCI treated paper wrapping and examine the surface of the test specimens.

A-3.5 The samples of VCI treated paper shall be taken to have passed the test, if no corrosion is observed on the surface of any of them.

ANNEX B

[Table 1, Sl No. (v)]

TEST FOR CONTACT CORROSIVITY

B-1 APPARATUS

B-1.1 Steel Specimen — Three; $50 \times 100 \times 3.2$ mm fabricated from cold rolled steel with the surface finished by Grit No. 220 emery grain (*see* IS 3178).

B-1.2 Glass Slides — Six; 75×25 mm microscope slides, non-corrosive [*see* IS 3099 (Part 2)].

B-1.3 Steel Bars — Six; $75 \times 25 \times 26$ mm.

B-1.4 Humidity Conditioner — A desiccator 240 mm in diameter and provided with a plate fitted with a single central support to facilitate handling and containing 50 ml of a solution of relative density as 1.173 at $24 \pm 2^\circ\text{C}$ containing AR Grade glycerine (*see* IS 1796) and distilled water to maintain a relative humidity of 65 ± 3 percent at 50°C .

B-1.5 Constant temperature Baths — Two; one maintained at $65 \pm 1^\circ\text{C}$, other circulating air-oven maintained at $25 \pm 1^\circ\text{C}$.

B-2 PREPARATION OF TEST ASSEMBLY

Place a strip of the impregnated or coated paper over one long surface with the overlaps taped to the sides of the steel bar. The tape shall be applied so that the edges of the tape are at least 6 mm away from the specimens. The papered surface of the steel bar shall be placed across the centre of the panel perpendicular to the length

of the panel. The area where the steel bar rests shall be marked with a diamond scribe to differentiate contact area from the remaining area of the test panel which shall serve as a blank.

B-3 PROCEDURE

B-3.1 Place the test assembly on the desiccator plate and condition it for 30 min in the constant temperature bath maintained at $65 \pm 1^\circ\text{C}$. After this period, transfer quietly the test assembly to the humidity conditioner, seal it and keep it for 20 h in the air oven. After this exposure period, remove the test assembly from the humidity conditioner and examine their surface for any evident signs of corrosion.

B-3.2 The material shall pass the test if the contact area within scribe marks on the test panel is not corroded, method or pitted. Crystalline haze or stain that may be readily removed with gauze, saturated with a suitable solvent such as methanol, toluene or xylene, shall not be taken as signs of corrosion.

B-3.3 If corrosion is evident in the blank area on the test panel, test shall be reported in triplicate. Also the test shall be repeated if one of the three specimens shows light or incipient corrosion, in such case test shall be repeated thrice and the material shall pass the test as prescribed in **B-3.2**.

ANNEX C

[Table 1, Sl No. (vi)]

LONG TERM PROTECTION TEST

C-1 PREPARATION OF PANEL

Four; 50 × 100 × 3 mm cold rolled steel panels conforming to Grade C 25 of IS 1570 (Part 2/Sec 1) required for this test shall be finished and cleaned as specified for the contact corrosivity test specimen (*see A-2*). Edges of the panel shall be rounded and two 3 mm diameter holes shall be drilled at opposite corners of the 100 mm side.

C-2 ASSEMBLY AND EXPOSURE

An unused fibre board box about 25 litre capacity, with the length, width and height equal shall be completely lined on the inside of all faces, except the top, with a single layer of treated carrier which shall be held in place with staples. The carrier shall have its treated side, if any, facing towards the centre of the box. One of the four panels shall be placed face up and centred on a 150 × 150 mm sheet of the treated carrier. The sheet shall be tightly wrapped around the panel and fastened with a double fold at the middle of the panel face; a single fold of the sheet shall be made at the ends of the panel. The wrapped panel shall be secured

in the prepared box with the folds of the sheet against the bottom of the box. The three remaining panels shall be suspended by stainless steel wires from two opposite top edges of the box. One panel shall be suspended in such position that its centre is at the approximate centre of the box cavity; the other two panels shall be suspended at the same level facing the centre panel at least 2.5 cm from the centre panel and the sides of the box. The seams of the box shall be fastened together with 75 mm wide tape.

Three strips of the tape shall be applied to both top and bottom of the box so that all seams are covered their full length. The tape applied over the centre lengthwise seam shall extend at least 75 mm to each of the end panels. The sealed box shall be exposed outdoors for 12 months in a louvered shed. Upon completion of the exposure period the panels shall be examined for any sign of corrosion.

C-3 The sample of VCI treated paper shall be taken to have passed the test, if no corrosion is observed on any of the panels exposed inside the box.

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